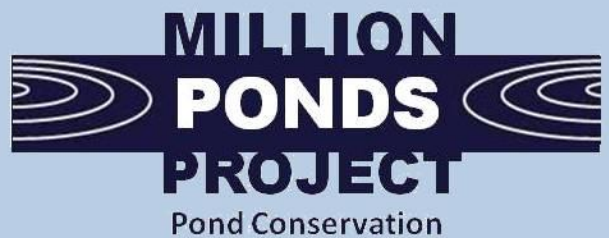


Creating ponds for amphibians and reptiles



A 50-YEAR PROJECT TO CREATE A NETWORK OF CLEAN WATER PONDS FOR FRESHWATER WILDLIFE

1. Identifying which species are at risk

There are four amphibian species which make it on to the Biodiversity Action Plan (BAP) priority list in the UK (listed in Table 1). Two of these, **Great Crested Newt** *Triturus cristatus* and **Common Toad** *Bufo bufo* are not yet rare in the UK. However, they are both in decline in Britain and/or Europe, and so have become a priority for protection and conservation action.

The BAP reptile, the **Grass Snake** *Natrix natrix* is also widespread but declining. Unlike its amphibian cousins, it does not need water to breed. However, amphibians are its main food source, so it benefits from the food supply that ponds provide. Great Crested Newt, Common Toad and Grass Snake (Figure 1) remain widespread in the lowlands, but are declining markedly in the north of the country. We know that pond creation for these species can be very successful, so by taking action now we can help to prevent further declines.



Figure 1. Some of our most familiar amphibians and reptiles – Great Crested Newt (top left), Common Toad (bottom left) and Grass Snake (right). Creating ponds for these species now can help to secure their futures.

To find out which of these BAP Species occur in your area visit the [BAP Species Map](#).

Key messages

- **Create clean water ponds**, these are the most wildlife rich ponds. They are free from pollution and excessive nutrients, allowing submerged plants and insects to thrive - important habitat and food for all of the UK's amphibians.
- **Locate ponds within the dispersal distance of the target species** to provide stepping stones across the landscape and to strengthen existing populations by increasing the number of potential breeding ponds. Make sure there are no barriers to dispersal between ponds.
- **Design ponds with broad shallow margins.** These will support stands of submerged, floating-leaved and emergent plants. They will also provide warm water to speed up tadpole development.
- **Don't introduce fish or non-native plants** to the pond as these will considerably reduce their value for amphibians.
- **Provide amphibian-friendly habitat adjacent to the pond.** This should include long grasses or herb rich meadows and cover in the form of scrub and fallen wood.

Species	BAP species	Conservation status	Distribution
Palmate Newt	Not a BAP species - Widespread	Bern Convention – App III WCA – Sch 5 protected from sale and trade IUCN – Least Concern	Widespread with a preference for more acidic soils.
Smooth Newt	Not a BAP species - Widespread	Bern Convention – App III WCA – Sch 5 protected from sale and trade IUCN – Least Concern	Widespread, but mainly absent from acidic soils.
Great Crested Newt	BAP species - Widespread	Habitats Directive Ann II, IV Bern Convention – App II WCA – Sch 5 IUCN – Least Concern	Widespread in lowland England and eastern Wales, but declining.
Common Toad	BAP species - Widespread	Bern Convention – App III WCA – Sch 5 protected from sale and trade IUCN – Least Concern	Found in lowland areas, but declining.
Natterjack Toad	BAP species - Restricted	Habitats Directive Ann IV Bern Convention – App II WCA – Sch 5 IUCN – Least Concern	Confined primarily to dune, but also some heathland habitat. Fewer than 60 sites in the UK.
Common Frog	Not a BAP species - Widespread	Habitats Directive Ann IV Bern Convention – App III WCA – Sch 5 protected from sale and trade IUCN – Least Concern	Widespread.
Pool Frog	BAP species - Restricted	Habitats Directive Ann IV Bern Convention – App III IUCN – Least Concern	Subject to reintroduction to a single site in England.
Grass Snake	BAP species - Widespread	Bern Convention – App III WCA – Sch 5 protected from killing, sale and trade IUCN – Least Concern	Found throughout much of lowland England and Wales, becoming progressively scarcer in the north.

2. Guidelines on creating ponds for amphibians and Grass Snake

Our rarest amphibians (Pool Frog and Natterjack Toad) have very specific habitat requirements. Detailed advice on creating ponds for these species is available elsewhere (see *Section 6. Further reading*). Although Great Crested Newt, Common Toad and Grass Snake differ in their exact habitat preferences, they also have a lot in common with each other and with the more common amphibians like Common Frog, Smooth Newt and Palmate Newt which provide food for Grass Snake.

Which ponds attract amphibians and Grass Snake?

1 Ponds with a clean water supply

Clean unpolluted water is always better for pond plants and invertebrates – and this in turn forms the basis for a good amphibian pond. Ponds in urban environments can be contaminated by road drains whilst those in farmed landscapes may receive high levels of nutrient pollution.

Ponds should be located where surface run-off or drains from agricultural areas and roads are minimal. Stream or ditch inflows should be avoided wherever possible, because this washes pollution straight into the pond and can bring in heavy loads of silt which quickly fill the pond, reducing its life to just a few years.

[Pond Creation Toolkit Factsheet 2](#) has more detailed advice on finding a clean source of water.



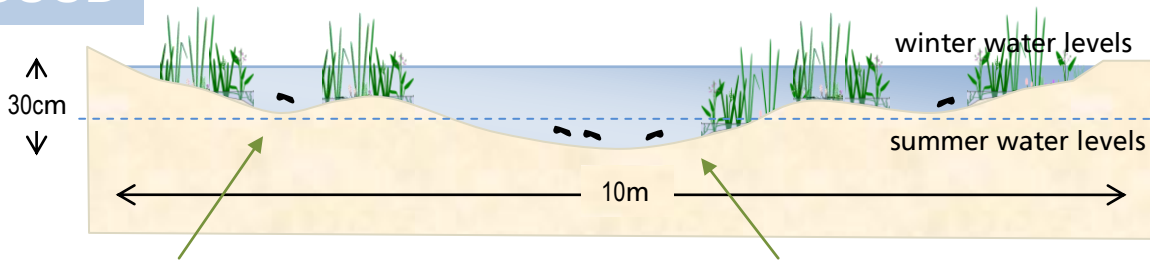
2 Variable pond depths and variable pond designs

Create shallow water areas at the pond edge (<10cm for at least 1m (5° slope)) to allow a rich community of marginal plants to develop, providing food and shelter for developing tadpoles. Shallow water also warms up quickly, providing common frogs with spawning sites in early spring and allowing the rapid growth of tadpoles of all species. Ideal maximum water depth varies for different species, with Common Toad the most tolerant of deep water. If a pond is shallow it is best to design it with a single basin so that tadpoles do not perish in sub-basins as the pond dries down in summer (Figure 2).

Figure 2. Pond designs for frogs, toads and newts

In large ponds a complex profile with separate basins can be very good for wildlife as it will add to the variety of the site. In small ponds, created for amphibians, create one basin which is likely to hold water throughout the breeding season.

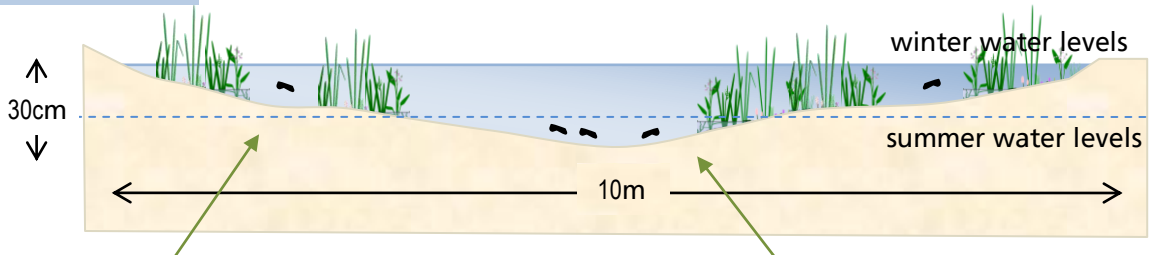
GOOD



Side basins will dry out. Tadpoles easily become trapped as water levels recede.

Central pond basin holds water throughout the year.

BETTER



Water levels still fluctuate, resulting in a broad drawdown zone. Tadpoles are not trapped and move to the pond centre as water levels drop.

Central pond basin holds water throughout the year in most years – occasional drying (about every 5 years) can be beneficial because it removes fish.

3 Submerged and emergent vegetation

For all amphibians, underwater plants provide egg-laying sites as well as an area of shelter. Plants growing underwater also provide homes and food for the invertebrates upon which newts and their tadpoles feed. However **tall emergent** vegetation should not dominate the pond to the point where it shades out other less dominant plants, as this will reduce the diversity of the pond.

Most of the aquatic plants that are able to grow submerged in deeper water fare best where the pond has clean water. Make sure the pond is located in a low intensity catchment to ensure it is fed from a clean water source. Plants colonise new ponds fairly rapidly, especially if the new ponds is located near to other water bodies or wetlands. Resist the temptation to plant up a new pond, as this risks introducing undesirable non-native invasive plants or fish.

4 Fish

Amphibian species vary in their ability to co-exist with fish. In general, fish are effective predators of amphibians, particularly their tadpoles. Even small species such as sticklebacks, prey on amphibian eggs and tadpoles. It is always better to keep the pond fish-free to benefit the widest possible spectrum of BAP Priority species. Certainly, fish should not be introduced to amphibian ponds and new ponds should not be linked to ditch networks or streams, as these usually allow fish colonisation. Occasional pond drying is a useful natural technique to remove unwanted fish.

5 Waterfowl

Ducks and geese often prey on adult amphibians and their eggs. This predation is natural and amphibian populations can withstand a degree of such predation. However, large populations of ducks or geese are unsustainable. They remove vegetation and their faeces add significant nutrients to the pond which leads to eutrophication. Waterfowl should not be stocked or encouraged by providing food or by creating 'duck islands'.

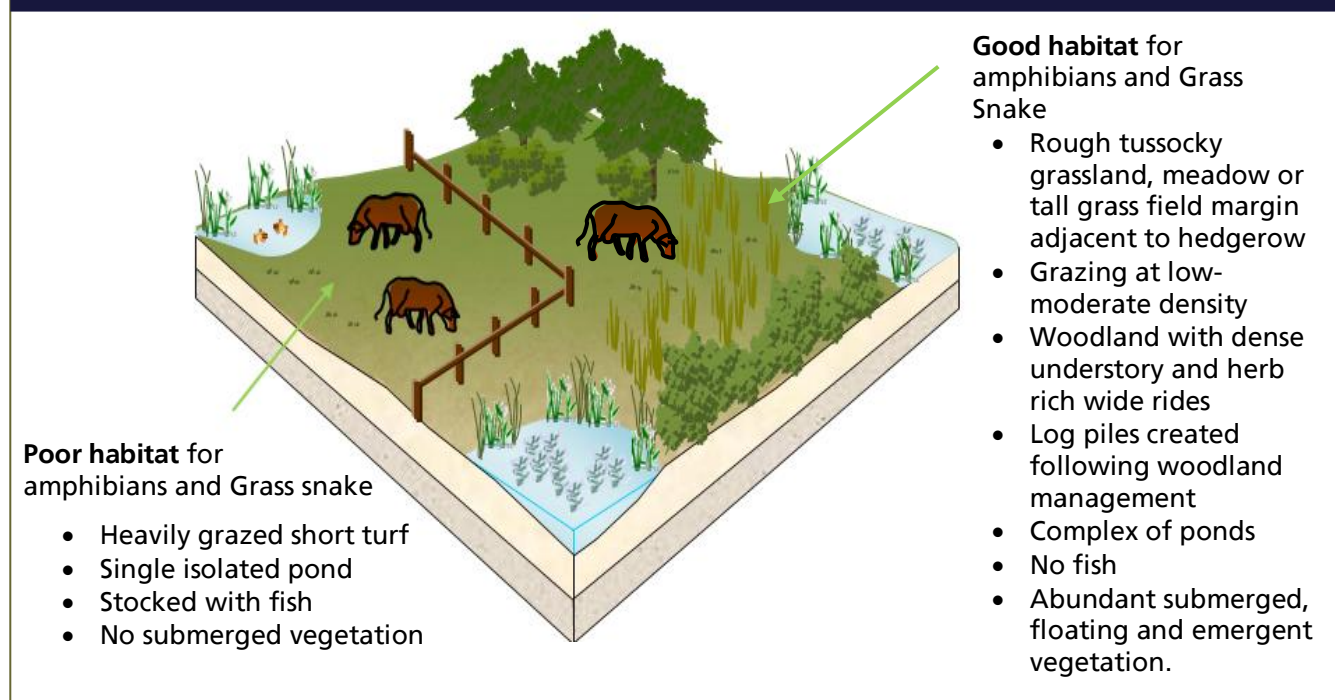
Which habitats around the pond do amphibians and Grass Snake need?

Although they breed in ponds, amphibians spend much of their time on land. Their terrestrial habitat requirements are simple – they need cover to provide damp resting places and to support the invertebrate prey on which they feed. Amphibians can find such cover in most 'natural' habitats, such as grassland, scrub and woodland. Tree stumps, mammal burrows, stone walls and the foundations and loose brickwork of old buildings may also provide places for amphibians to shelter or hibernate.

It is important that cover is present immediately around the pond (but not shading it), because young frogs, toads and newts need damp habitat to move into as they leave the water. This habitat not only provides places to hide and somewhere to find their invertebrate food, but the moisture prevents desiccation of small amphibians during the driest parts of the year.

Warm ponds are favourable for amphibian growth and development. Hence, new ponds should be located in sunny locations. A belt of trees or scrub a few metres to the north of a pond can act as a windbreak that creates a warm microclimate around the pond (Figure 3). Long-term maintenance of the pond site should aim to control other scrub and tree growth to avoid excessive shading of the pond.

Figure 3. Providing good habitat adjacent to the pond





Hibernation sites

Hibernacula are sometimes created as overwintering shelters for amphibians (Figure 4). In practice, the benefits of these structures may be limited if the surrounding landscape is generally hospitable with adequate vegetation for the amphibians to find overwintering sites. However, hibernacula may be beneficial at sites where the natural vegetation cover is sparse. In such areas, their construction can be a convenient way of utilising spoil from pond creation or other habitat management.

Pond networks

In common with most pond plants and animals, the long-term survival of amphibians is dependent on networks of suitable ponds. Although there is a widespread belief that amphibians return to breed in the ponds where they were spawned, in fact, movement between ponds is common, and essential to the long-term success of amphibian populations.

New ponds should be created within migration distance of existing breeding sites. Frogs and Toads seem quite able to colonise ponds within one kilometre of an existing breeding site. Newts have lower effective colonisation ranges, and new ponds intended for them should be within 400-500m, at most, from existing populations.

Pond creation should be planned to create or enhance pond networks. Ideally, ponds within a network should be linked by a landscape that is amphibian friendly (as described in *habitat around the pond*). Failing that, ponds should be closely spaced, to minimise the migration distance across unsuitable habitat.

Continuous tracts of amphibian friendly habitat between ponds are ideal, but corridors of suitable habitat (e.g. field margins and hedgerows) can be used if this is the only practical option. Landscape features, such as major roads and rivers, or extensive tracts of unsuitable habitat, are barriers to dispersal. Pond networks should be planned to avoid them.

Figure 4. Creating hibernacula

Piles of debris provide excellent sheltering, egg laying and hibernation sites for amphibians and reptiles.



Hibernacula are easy to create. They can be simple piles of logs or may be partially covered over with soil dug from the newly created pond.



If the site already has lots of natural cover then this is more likely to be used than the hibernacula. They can also make good use of brush left over after management work.



3. Specific requirements

Common Toad

Pond location. Locate ponds within 1km of existing toad ponds. They spend a large proportion of their lives in terrestrial habitats and may disperse over 2km from the breeding pond to find woodland or grassland sites. One of the most important factors in pond location is to avoid barriers to dispersal, such as roads, particularly around breeding ponds.

Pond design. Toads tend to prefer larger water bodies than the other amphibians. Toad tadpoles and adults are also distasteful to most fish species so, in contrast to other species, they can thrive in ponds and lakes with populations of fish. In areas where large ponds are uncommon, such as the chalky areas of the Sussex Downs, toads will use smaller waterbodies if nothing else is available. However, as a general rule, typical toad ponds are at least 20m diameter and have a water depth of 90cm or more (Figure 5).

Clean water. Because they can tolerate fish, toads are happy in ponds linked to streams and ditches. However in the long-term, stream-fed ponds tend to fill in more quickly with silt and are often polluted with nutrients, reducing their value for other wildlife. Toads also prefer ponds with clear water, and do not tolerate high densities of stocked fish. Indeed because toad ponds can also be used by Great Crested Newts which do not tolerate fish, it is best to keep ponds fish-free.

Vegetation structure. Pond vegetation is beneficial for toads. Breeding toads wrap their spawn strings around submerged plants, and emergent vegetation can provide them with a refuge from bird predators. However, toad tadpoles also benefit from areas of water free from emergent plants. In larger waterbodies, open water areas usually occur naturally where it is too deep for vegetation to establish. However, open water can also be maintained in smaller ponds by manually removing vegetation along parts of the margin in the late summer/autumn, after toadlets have left the water.

Great Crested Newt

Pond location. Create new ponds adjacent to existing populations, because these are larger where they live as sub-populations in a complex of ponds within 250m of one another. Create new pond complexes within 500m of an existing complex to allow individuals to spread across the landscape. The habitat between complexes needs to be amphibian friendly, e.g. rough grassland or connecting hedgerows, without barriers such as roads.

Ponds in regularly flooded parts of the floodplain should also be avoided because they are likely to be naturally colonised by fish. Direct links to ditches and streams should be avoided for similar reasons.

Woodlands can be excellent places to create ponds for Great Crested Newt because they usually have ponds with abundant submerged plant growth and good terrestrial habitat (Figure 6).



Figure 5. Mating toads by their breeding pond - this pond is 2.5ha in surface area and up to 1.5m deep.

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Figure 6. A woodland pond complex used by Great Crested Newts. Clean water promotes growth of submerged aquatic plants (egg laying sites) whilst terrestrial habitat is provided by thickets of scrub and fallen logs.

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Pond design. Great Crested Newt populations are greatest in 'medium-sized' ponds (approximately 500-1000m²), though they can thrive in ponds much smaller than this e.g. 100m². Great Crested Newts are very vulnerable to fish predation and one of the main aims of pond design for this species is to create ponds that remain fish-free.

Ponds should be shallow (e.g. maximum depth <1m) so that they are less attractive to fish. It can be an advantage if the pond dries-down to little or no water in late summer. Ponds that hold water until late summer will allow most newt-poles to complete the tadpole stage, whilst also removing any fish. If ponds occasionally dry out earlier than this (e.g. every three or four years in drought years) it is not disastrous. Great Crested Newt adults are long-lived (10+ years), so populations can survive occasional years where the young do not survive, given the benefits of a fish-free pond in the remaining years.

Ponds with frequent public access are more likely to suffer fish introductions. For more information about creating ponds in areas of public access go to [Supplementary Advice Factsheet: pond designs in areas of public access](#) for more information.

Clean water. The Great Crested Newt is tolerant of some nutrient enrichment, but to do well they need abundant submerged vegetation which will only develop where ponds are fed from a clean water source. Groundwater-fed ponds which collect water from unpolluted catchments (e.g. low intensity grasslands and woodlands) or surface water-fed ponds in low intensity farmed landscapes will be the best source of water for Great Crested Newt ponds.

Vegetation structure. The Great Crested Newt likes to have plants on which to lay eggs, such as Floating Sweet-grass *Glyceria* spp., Water Mint *Mentha aquatica* and Water Forget-me-not *Myosotis scorpioides* as part of a suit of submerged, floating and emergent leaved plant species. Ponds should also retain some open water in which mating displays can take place.

Licensing. The Great Crested Newt is strictly protected by law (from disturbance, capture, killing and damage to habitat). Hence, when creating ponds in areas where Great Crested Newts may already be present, care should be taken not to disturb potential hibernation sites from October to February. Instead, work should be carried out in these areas from April to June when the newts are more likely to be in the pond. Similarly, avoid major work close to Great Crested Newt ponds (within 50-100m) between February and September/October when newts will be migrating to and from the pond. Discuss plans to create ponds for Great Crested Newt with Natural England or the Countryside Council for Wales. They will probably ask you to prepare a method statement which will set out what work you are planning on doing and the work schedule (www.naturalengland.org.uk/ourwork/regulation/wildlife/species/epslicensing.aspx).

Grass Snake

Grass Snakes are often found in or near wetland habitats, because they mainly feed on amphibians and to a lesser extent, fish. Creating 'good amphibian ponds' is therefore very important to Grass Snake conservation, i.e. small, shallow ponds (<0.5m deep) with gently shelving margins which are free from fish (Figure 7). Many wildlife garden ponds make excellent ponds for Grass Snakes.

Grass Snakes also need areas of dry, terrestrial habitat, comprising a mix of vegetation cover with some open spaces in which to bask in the sun. Spoil from pond excavation can be used to create a warm sunny bank or hibernation site. Grass Snakes need warm microhabitats to incubate their eggs. In most cases they use the heat generated from decomposing vegetation, such as found in a large compost heap or similar. Brush from pond or wetland management tasks, such as cutting reeds, can also create good egg laying sites.



Figure 7. A good amphibian pond, like this one, will attract Grass Snakes to the site.

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4. Designing garden ponds for amphibians and Grass Snake

Many garden ponds can be great places for amphibians and Grass Snake, provided that they are well designed and have amphibian friendly habitats directly adjacent to the pond.

Fill your pond with clean water. It is tempting to fill a new garden pond with tap water. However, tap water is often much higher in nutrients than rain water. These nutrients will cause algae to grow in the pond which will reduce the area of open water available for amphibians and suppress the growth of other pond plants. It's better to let ponds fill up when it rains or use rainwater stored in water butts.

Make broad, gently sloping pond margins. If you have the space available, aim for a water depth of less than 10cm over at least 1m to support lots of marginal plants. Ready-made ponds often have steep sides so it is better to use a flexible pond liner to create a more natural pond profile.

Water levels may fluctuate over the summer and that's ok, avoid topping up with tap water. If you create some deeper water, about 0.5m, the pond will probably hold some water throughout the year. Even if a pond completely dries out occasionally the pond life will come back very quickly once water returns.

Planting-up ponds. In most situations it is better not to introduce plants into newly created ponds. Pond plants will arrive very quickly on their own. However, if this is a small pond in an urban garden, you may want to add some plants. If you want a really good wildlife pond in your garden you should only use native plants. Be really careful to check that the plants you buy do not bring invasive species in with them, such as New Zealand Pigmyweed *Crassula helmsii*.

Ideally you should allow a fringe of vegetation to develop around most of the pond edge, grading into shrubs around the garden perimeter (Figure 8). Long grasses or a wildflower meadow will provide shelter as animals enter and leave the pond. Avoid putting paving slabs up to the pond edge as they will increase the risk of predation. Instead, consider creating a rockery to provide lots of hiding places and bare rocks which Grass Snake can use as basking sites.

Do not stock wildlife ponds with fish. Fish will eat the eggs and tadpoles of amphibians (except Common Toad) and few will make it to adulthood in garden ponds which are stocked with a lot of fish. If you do want fish make sure the pond is large enough to have an area with dense plant growth to provide refuges to amphibians. Fish will find it harder to get in here and frogs and newts will be able to spawn in relative safety. Even better, create another separate pond for wildlife and keep the ornamental pond for your fish.

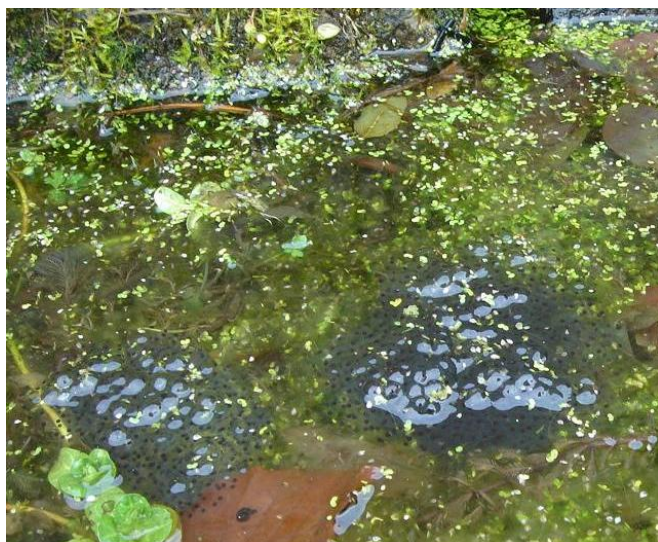
Garden refuges. Compost heaps are great habitats for amphibians, as they provide hibernation sites and abundant supplies of insect prey. Grass snakes also make use of compost heaps as they provide excellent egg laying sites. Log piles created from the brush collected during garden maintenance will also provide good invertebrate habitat. Really large logs in a stack will have big gaps which leave amphibians feeling exposed, so create a pile using a mixture of large logs and small twigs, or a mixture of logs and turf to create lots of small cavities.

Garden pond complexes. Because most of our gardens are relatively small, it is unlikely that you will be able to create a large complex of ponds in a single garden. However, rural garden ponds may form part of a complex with ponds in the surrounding countryside. In urban gardens, your pond may form a pond complex with your neighbour's garden ponds. Encourage them to manage their ponds for wildlife as well, to create a large area of amphibian friendly habitat.

Pond Conservation has created a free booklet - [Creating Garden Ponds for Wildlife](#) which contains detailed information on pond designs and pond creation techniques for garden ponds. We also have a [Garden Pond Blog](#) to help answer all your Garden Pond queries.



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Figure 8. Frog spawn in a shallow fish-free garden pond (left) and dense planting in a rockery adjacent to the pond (left) to provide cover for amphibians.

5. Further reading

- Baker, J., Beebee, T., Buckley, J., Gent, T. and Orchard, D. (2011). Amphibian Habitat Management Handbook. Amphibian and Reptile Conservation, Bournemouth.
- Beebee, T. and Denton, J. (1996) Natterjack Toad conservation handbook. English Nature.
- Beebee, T. and Griffiths, R. (2000) Amphibians and Reptiles. New Naturalist Series 87. Harper Collins.
- Edgar, P., Foster, J. and Baker, J. (2010) Reptile Habitat Management Handbook. Amphibian and Reptile Conservation, Bournemouth.
- Field Studies Council (1999) AIDGAP guide to the reptiles and amphibians of Britain and Ireland. FSC, Shrewsbury.
- Langton, T. Beckett, C. and Foster, J. (2001) Great Crested Newt Conservation Handbook. Froglife, Halesworth.

For further information about the Million Ponds Project and to consult other factsheets in the Pond Creation Toolkit, please visit www.pondconservation.org.uk/millionponds or email enquiries to info@pondconservation.org.uk

